

LA-UR-21-27850

Approved for public release; distribution is unlimited.

Title: Cosmic Plastics D33/6120 vs. Sumitomo Bakelite 52-01

Author(s): Weaver, Leeson Scott
Fisher, Kane J.

Intended for: Report

Issued: 2021-08-05

Disclaimer:

Los Alamos National Laboratory, an affirmative action/equal opportunity employer, is operated by Triad National Security, LLC for the National Nuclear Security Administration of U.S. Department of Energy under contract 89233218CNA000001. By approving this article, the publisher recognizes that the U.S. Government retains nonexclusive, royalty-free license to publish or reproduce the published form of this contribution, or to allow others to do so, for U.S. Government purposes. Los Alamos National Laboratory requests that the publisher identify this article as work performed under the auspices of the U.S. Department of Energy. Los Alamos National Laboratory strongly supports academic freedom and a researcher's right to publish; as an institution, however, the Laboratory does not endorse the viewpoint of a publication or guarantee its technical correctness.



Cosmic Plastics D33/6120 vs. Sumitomo Bakelite 52- 01

Leeson Weaver, Kane Fisher
DP-DO

August 11, 2021

Table of Contents

Properties Overview

- Comparison and explanation of properties

Processing and Formulation

- Explanation of the molding processes and material composition

Conclusions

- Determining the reason behind the differences

Properties

Cosmic Plastics D33/6120

Specific Gravity: 1.72

H₂O Absorption: .25%

Mold Shrinkage: .001-.004 in/in

Impact Strength: .5-1.2 ft-lb/in

Flexural Strength: 13,000-15,000 psi

Compressive Strength: 24,000-26,000 psi

Tensile Strength: 6,000-10,000 psi

Arc Resistance: 145 seconds

Dielectric Strength: 339.999 kV/in

Dielectric Constant: 4.2

Dissipation Factor: .015

Thermal Expansion: 12 10⁻⁶/°C

Sumitomo Bakelite 52-01

Specific Gravity: 1.93

H₂O Absorption: .25%

Mold Shrinkage: .002-.004 in/in

Impact Strength: .59 ft-lb/in

Flexural Strength: 16,000 psi

Compressive Strength: 18,900 psi

Tensile Strength: 10,000 psi

Arc Resistance: 150 seconds

Dielectric Strength: 351.000 kV/in

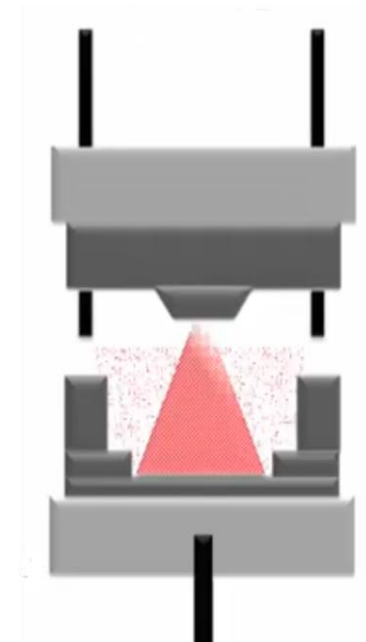
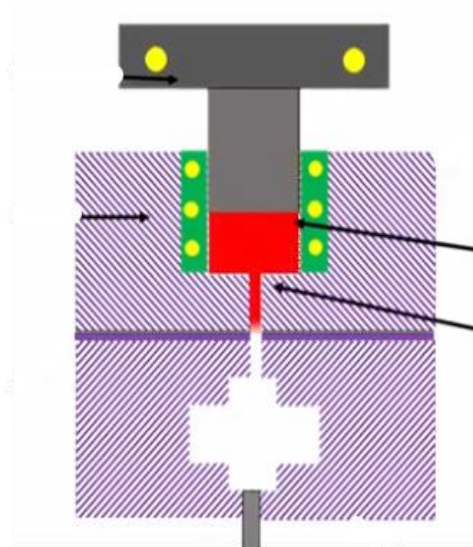
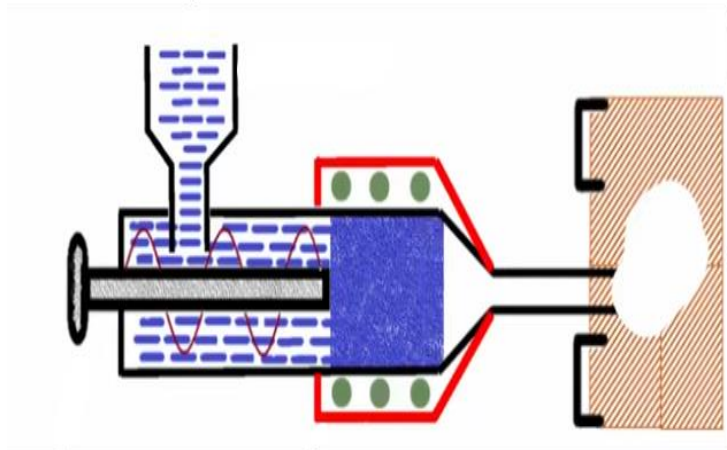
Dielectric Constant: 3.5

Dissipation Factor: .016

Thermal Expansion: 21 10⁻⁶/°C

Processing & Formulation

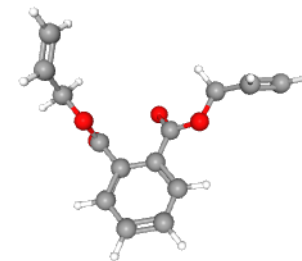
- Compositions
 - Diallyl phthalate, short glass reinforcement, mineral filler, catalyst, pigment
- Molding Procedures
 - Injection, transfer, and compression
- Molding Parameters
 - Temperature and pressure



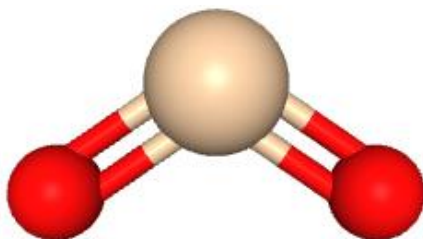
Molding Conclusions

- Differing molding procedures and parameters are not likely to be the only factors that cause the differences in properties
 - This is due to the molding parameters being quite similar between the two Technical Data Sheets and both plastics being transfer molded at New Dynamics
- Molding procedures and parameters would be able to slightly change some of the properties that were different between the two materials, but some of the changes were too drastic to be explained away by anything to do with the molding of the parts
 - Ex: specific gravity, compressive strength, and thermal expansion

Composition Conclusions



- Unique composition must be the reason behind differing properties
 - Sumitomo Bakelite 52-01 likely has a higher concentration of fiberglass than Cosmic Plastics D33/6120 because of higher specific gravity
 - Fiberglass has a density of 2.65 g/cm³ and diallyl phthalate has a density of 1.12 g/cm³
 - The most likely proportions for the two materials are (by weight):
 - Sumitomo Bakelite 52-01 with 31% diallyl phthalate and 36% fiberglass
 - Cosmic Plastics D33/6120 with 40% diallyl phthalate and 27% fiberglass
- These numbers are just rough estimates, though, based off a few assumptions:
 - Mineral fillers, pigments, and catalysts are the same between D33/6120 and 52-01
 - Mineral fillers, pigments, and catalysts make up roughly 33% of the overall weight
 - The composition of 52-01 is similar to what is presented in the D33/6120 SDS
- More research into these materials should be done to eliminate the necessity of these assumptions and make more accurate calculations



DAP: Cosmic Plastics

D33/6120 vs. Sumitomo

Bakelite 52-01

Leeson Weaver

LA-UR-21-xxxxx
06/23/2021

References and Acknowledgements

- Kane Fisher, James Hughes
- Molding diagrams taken from Engineering Chemistry on YouTube
- Diallyl phthalate and SiO_2 models from PubChem